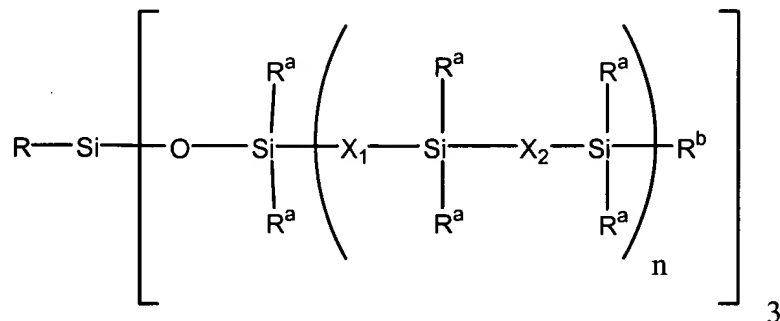


CLAIMS

What is claimed is:

- 5 1. A compound represented by the following structural formula:



wherein:

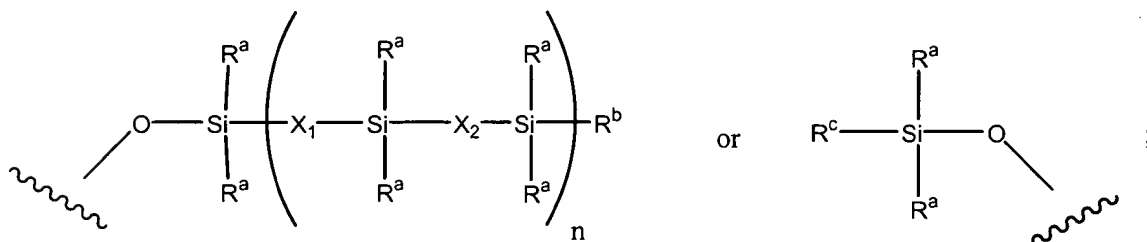
X_1 and X_2 are independently each an inert linking group;

10 each R^a is independently a substituted or unsubstituted aliphatic group or a substituted or unsubstituted aryl group;

n is 1, 2, 3 or 4;

R is a substituted or unsubstituted aliphatic group, a substituted or unsubstituted aryl group or is represented by a structural formula selected from:

15

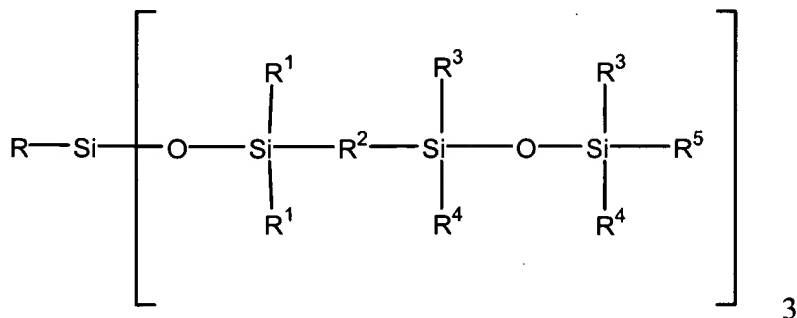


each R^b is independently an epoxide substituted aliphatic group; and

20 R^c is H, an unsubstituted aliphatic group, a substituted aliphatic group, an unsubstituted aryl group, a substituted aryl group, a substituted siloxane group, an unsubstituted siloxane group, a substituted polysiloxane group or an

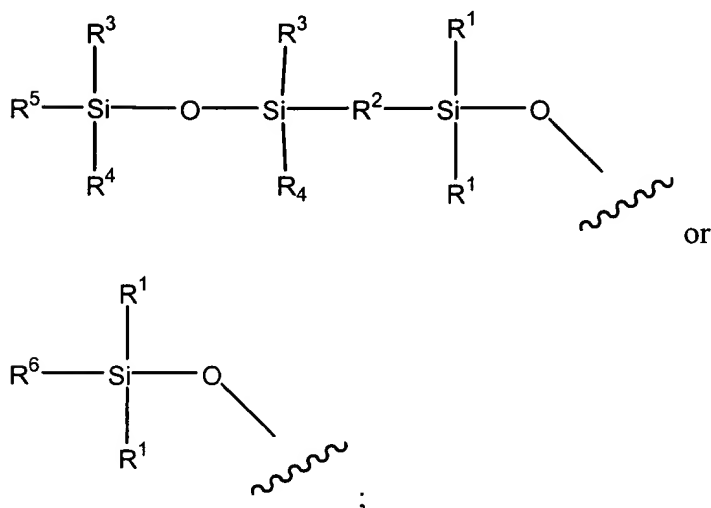
unsubstituted polysiloxane group.

2. The compound of Claim 1 wherein the compound is represented by the following structural formula:



5

wherein R is represented by a structural formula selected from:



wherein:

- 10 each group R^1 , each group R^3 and each group R^4 is independently a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group;

- each group R^2 is independently a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} arylalkylene, or arylene group,
 15 $-\text{Y}_1-[\text{O}-\text{Y}_1]_p-$, $-\text{Y}_1-\text{Si}(\text{R}^z)_2-\text{Y}_1-$, $-\text{Y}_1-\text{Si}(\text{R}^z)_2-\text{Y}_1-\text{O}-\text{Y}_1-\text{Si}(\text{R}^z)_2-\text{Y}_1-$, or $-\text{Y}_1-\text{Si}(\text{R}^z)_2-\text{Y}_1-\text{Si}(\text{R}^z)_2-\text{Y}_1-$;

each group R^5 is independently, an epoxide substituted aliphatic group having 2-10 carbon atoms; and

each group R^6 is independently hydrogen, an alkenyl, a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} -alkyl or aryl or $R^Z-(O-Y_1)_m-$, $(R^Z)_3Si-(O-Si(R^Z)_2)_q-Y_1-$ or $(R^Z)_3Si-(O-Si(R^Z)_2)_q-O-$;

each R^Z is independently a substituted or unsubstituted C_{1-12} alkyl group, C_{1-12} cycloalkylalkyl group, aryl substituted C_{1-12} alkyl group or aryl group;

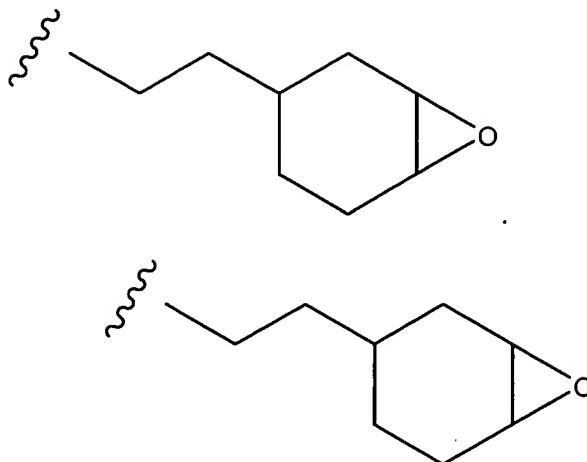
each Y_1 is independently a C_{1-12} alkylene group;

p is an integer from 1 to 5; m is an integer from 1 to 10; and q is an integer from 0 to 4.

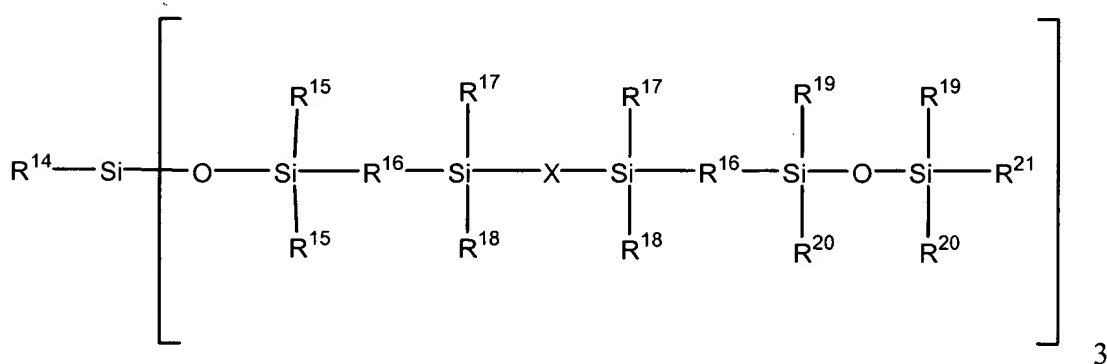
3. The compound of Claim 2 wherein each group R^2 is independently, a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} substituted arylalkylene, or arylene group; and each R^6 is independently a substituted or unsubstituted C_{1-12} alkylsilane, C_{1-12} cycloalkylsilane, C_{1-12} alkoxyasilane, aryl substituted C_{1-12} alkylsilane, a hydrogen, a vinyl, a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} dialkylether, $(C_{1-12}$ cycloalkyl) C_{1-12} alkylether, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group.

4. The compound of Claim 3 wherein at least one R^5 comprises a cycloalkene oxide.

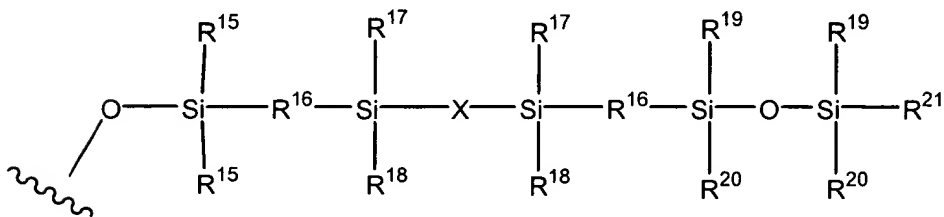
5. The compound of Claim 3 wherein each R^5 is represented by the following structural formula:



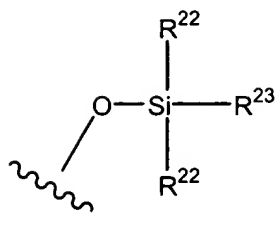
6. The compound of Claim 3 wherein R^1 is a methyl group; each group R^2 is an ethylene, hexylene, or octylene group; each group R^3 is a methyl group; each group R^4 is a methyl group; each group R^5 is a 2-(3,4-epoxycyclohexyl) ethyl grouping, and each group R^6 is a hydrogen or ethenyl.
7. The compound of Claim 1 wherein the compound is represented by the following structural formula:



wherein R^{14} is represented by a structural formula selected from:



or



each group R^{15} , each group R^{17} , each group R^{18} , each group R^{19} , each group R^{20} and each group R^{22} is independently a substituted or unsubstituted C₁₋₁₂ alkyl, C₁₋₁₂ cycloalkyl, aryl substituted C₁₋₁₂ alkyl or aryl group;

5 each group R^{16} is independently a substituted or unsubstituted C₁₋₁₂ alkylene, C₁₋₁₂ cycloalkylene, C₁₋₁₂ arylalkylene, or arylene group, $-Y_1$, $-[O-Y_1]_p-$, $-Y_1-Si(R^Z)_2-Y_1-$, $-Y_1-Si(R^Z)_2-Y_1-O-Y_1-Si(R^Z)_2-Y_1-$, or $-Y_1-Si(R^Z)_2-Y_1-Si(R^Z)_2-Y_1-$;

10 each R^{21} is independently an epoxide substituted aliphatic group having 2-10 carbon atoms;

R^{23} is independently hydrogen, an alkenyl, a substituted or unsubstituted C₁₋₁₂ alkyl, C₁₋₁₂ cycloalkyl, aryl substituted C₁₋₁₂-alkyl or aryl or $R^Z-(O-Y_1)_m-$, $(R^Z)_3Si-(O-Si(R^Z)_2)_q-Y_1-$ or $(R^Z)_3Si-(O-Si(R^Z)_2)_q-O-$;

15 each group X is independently oxygen or R^{16} ;

each R^Z is independently a substituted or unsubstituted C₁₋₁₂ alkyl group, C₁₋₁₂ cycloalkylalkyl group, aryl substituted C₁₋₁₂ alkyl group or aryl group;

each Y_1 is independently a C₁₋₁₂ alkylene group;

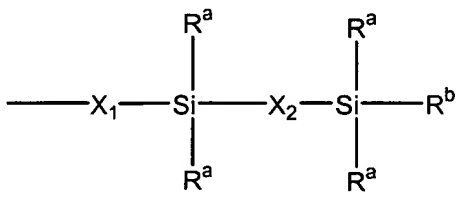
20 p is an integer from 1 to 5; m is an integer from 1 to 10; and q is an integer from 0 to 4.

8. The compound of Claim 7 wherein each group R^{16} is independently a substituted or unsubstituted C₁₋₁₂ alkylene, C₁₋₁₂ cycloalkylene, aryl substituted C₁₋₁₂ alkylene or arylene group; R^{23} is, independently, a hydrogen, a monovalent substituted or unsubstituted C₁₋₁₂ alkyl, C₁₋₁₂ dialkylether
- 25

group, an unsubstituted aryl group, a substituted aryl group;

each group R^8 is R^9 , hydrogen, an alkenyl, a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} -alkyl or aryl or $R^Z-(O-Y_1)_m-$, $(R^Z)_3Si-(O-Si(R^Z)_2)_q-Y_1-$ or $(R^Z)_3Si-(O-Si(R^Z)_2)_q-O-$;

5 each R^9 is independently represented by the following structural formula:



wherein:

X_1 and X_2 are independently an inert linking group;

10 each R^a is independently a substituted or unsubstituted aliphatic group or a substituted or unsubstituted aryl group;

each R^b is an aliphatic group substituted with an epoxide;

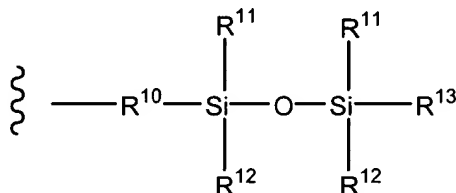
each R^Z is independently a substituted or unsubstituted C_{1-12} alkyl group, C_{1-12} cycloalkylalkyl group, aryl substituted C_{1-12} alkyl group or aryl group;

each Y_1 is independently a C_{1-12} alkylene group;

m is an integer from 1 to 10; and q is an integer from 0 to 4.

13. The compound of Claim 12 wherein:

20 each R^7 is independently a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group;



each R^9 is represented by

each group R^{10} is independently a substituted or unsubstituted C_{1-12}

alkylene, C₁₋₁₂ cycloalkylene, C₁₋₁₂ arylalkylene, or arylene group,
 $-Y_1-[O-Y_1]_p-$, $-Y_1-Si(R^Z)_2-Y_1-$, $-Y_1-Si(R^Z)_2-Y_1-O-Y_1-Si(R^Z)_2-Y_1-$, or
 $-Y_1-Si(R^Z)_2-Y_1-Si(R^Z)_2-Y_1-$;

each R^Z is independently a C₁₋₁₂ alkyl group;

5 each Y₁ is independently a C₁₋₁₂ alkylene group;

each group R¹¹ and R¹² is independently a substituted or unsubstituted
 C₁₋₁₂ alkyl, C₁₋₁₂ cycloalkyl, aryl substituted C₁₋₁₂ alkyl group or aryl group;
 and

10 each group R¹³ is independently an epoxide substituted aliphatic group
 having from 2-10 carbon atoms.

14. The compound of Claim 13 wherein:

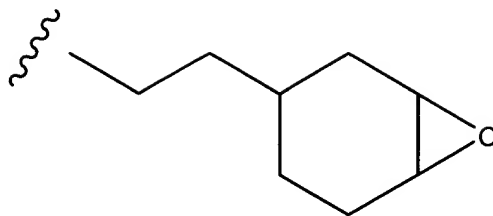
15 R⁸ is substituted or unsubstituted C₁₋₁₂ alkylsilane, C₁₋₁₂
 cycloalkylsilane, C₁₋₁₂ alkoxysilane, arylsubstituted C₁₋₁₂ alkyl silane or a
 substituted or unsubstituted 1-alkenyl group or a substituted or unsubstituted
 C₁₋₁₂ *n*-alkenyl group where *n* is greater than or equal to 1;

R¹⁰ is independently a C₁₋₁₂ alkylene, C₁₋₁₂ cycloalkylene, C₁₋₁₂
 arylalkylene, or arylene group.

20 15. The compound of Claim 14 wherein at least one group R¹³ comprises a
 cycloalkene oxide.

16. The compound of Claim 15 wherein each R¹³ is represented by the following
 structural formula:

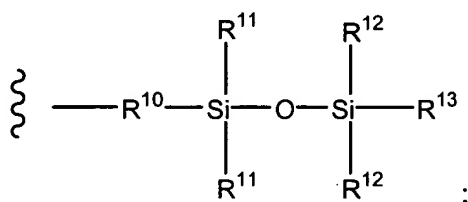
25



17. The compound of Claim 14 wherein:

R^7 is a methyl group,

R^8 is ethenyl or R^9 ;



each R^9 is

each group R^{10} is $-(CH_2)_2-$, $-(CH_2)_6-$ or $-(CH_2)_8-$;

each group R^{11} and R^{12} are a methyl group; and

each group R^{13} is a 2-(3,4-epoxycyclohexyl) ethyl group.

10

18. A holographic recording medium comprising:

- a) at least one polyfunctional epoxide monomer or oligomer which undergoes acid initiated cationic polymerization, wherein: 1) each epoxide in the monomer or oligomer is connected by a linker group comprising a siloxane to a silicon atom; or 2) each epoxide in the monomer or oligomer is connected by a linker group to a central polysiloxane ring; and each monomer or oligomer has an epoxy equivalent weight of greater than about 300 g/mole epoxide;
- b) a binder which is capable of supporting cationic polymerization;
- c) an acid generator capable of producing an acid upon exposure to actinic radiation; and optionally

15

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d) a sensitizer.

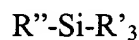
19. The holographic recording medium of Claim 18, additionally comprising a difunctional epoxide monomer.

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20. The holographic recording medium of Claim 18, additionally comprising a monofunctional epoxide monomer.

21. The holographic recording medium of Claim 18 wherein the polyfunctional epoxide monomer or oligomer is represented by the following structural formula:

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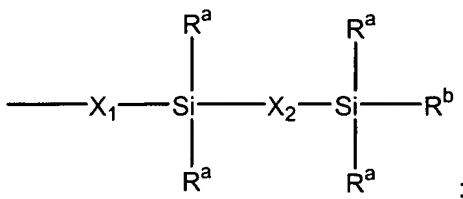
wherein each R' independently comprises an aliphatic group substituted with epoxide, said aliphatic group being connected to the silicon atom by a linker comprising a siloxane group; and

15

R'' is R' or -H, a substituted aliphatic group, an unsubstituted aliphatic group, a substituted aryl group, an unsubstituted aryl group a substituted siloxane group, an unsubstituted siloxane group, a substituted polysiloxane group or an unsubstituted polysiloxane group.

20

22. The holographic recording medium of Claim 21 wherein each R' comprises a group represented by the following structural formula:



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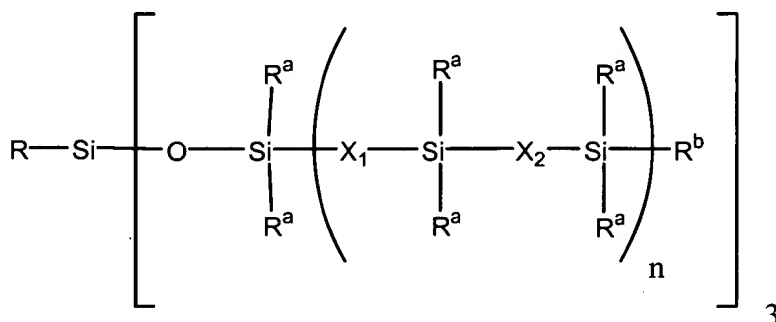
wherein:

X₁ and X₂ are independently an inert linking group;

each R^a is independently a substituted or unsubstituted aliphatic group or a substituted or unsubstituted aryl group; and

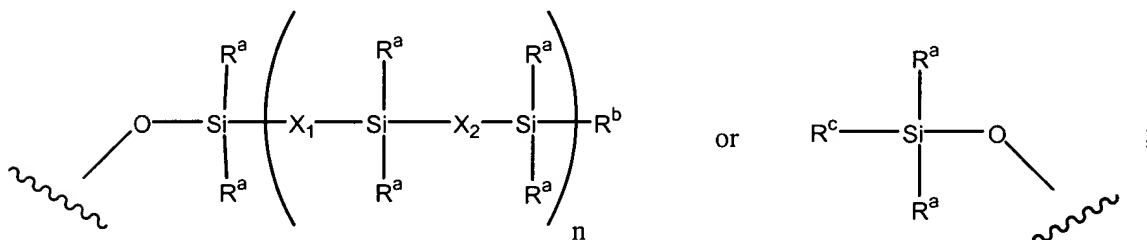
each R^b is an aliphatic group substituted with an epoxide.

23. The holographic recording medium of Claim 18 wherein the polyfunctional epoxide monomer is by the following structural formula:



wherein:

- X_1 and X_2 are independently each an inert linking group;
 each R^a is independently a substituted or unsubstituted aliphatic group or a substituted or unsubstituted aryl group;
 n is 1, 2, 3 or 4;
 R is a substituted or unsubstituted aliphatic group, a substituted or unsubstituted aryl group or is represented by a structural formula selected from:

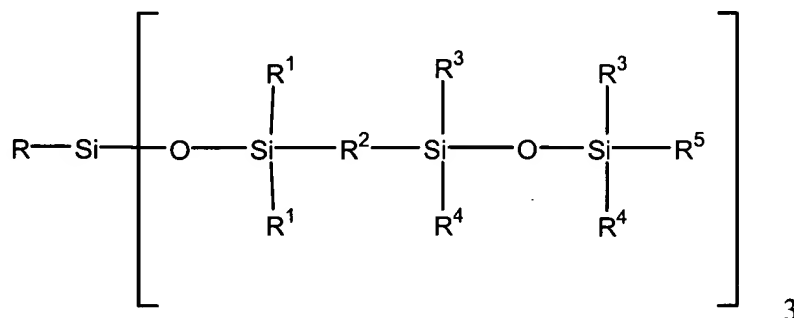


each R^b is independently an epoxide substituted aliphatic group; and

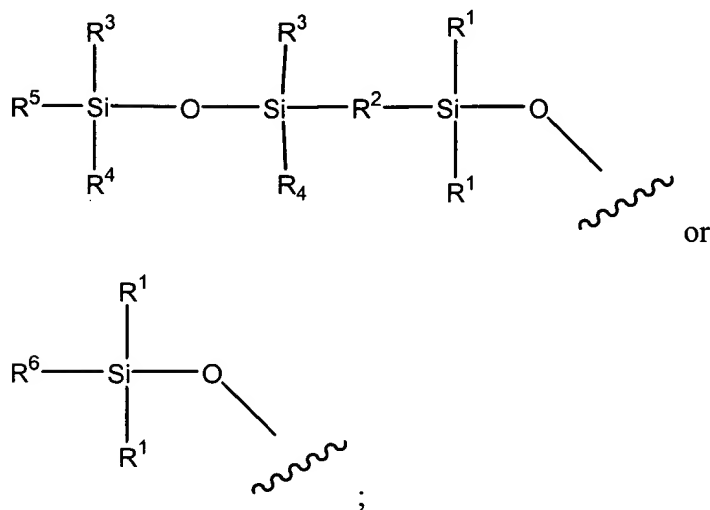
R^c is H, an unsubstituted aliphatic group, a substituted aliphatic group, an unsubstituted aryl group, a substituted aryl group, a substituted siloxane group,

an unsubstituted siloxane group, a substituted polysiloxane group or an unsubstituted polysiloxane group.

24. The holographic recording medium of Claim 23 wherein the polyfunctional
5 epoxide monomer is represented by the following structural formula:



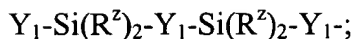
wherein R is represented by a structural formula selected from:



10 wherein:

each group R^1 , each group R^3 and each group R^4 is independently a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group;

15 each group R^2 is independently a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} arylalkylene, or arylene group, -
- Y_1 -[O- Y_1] $_p$ -, - Y_1 -Si(R^z) $_2$ - Y_1 -, - Y_1 -Si(R^z) $_2$ - Y_1 -O- Y_1 -Si(R^z) $_2$ - Y_1 -, or -



each group R^5 is independently, an epoxide substituted aliphatic group having 2-10 carbon atoms; and

5 each group R^6 is independently hydrogen, an alkenyl, a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} -alkyl or aryl or $R^Z-(O-Y_1)_m-$, $(R^Z)_3Si-(O-Si(R^Z)_2)_q-Y_1-$ or $(R^Z)_3Si-(O-Si(R^Z)_2)_q-O-$;

each R^Z is independently a substituted or unsubstituted C_{1-12} alkyl group, C_{1-12} cycloalkylalkyl group, aryl substituted C_{1-12} alkyl group or aryl group;

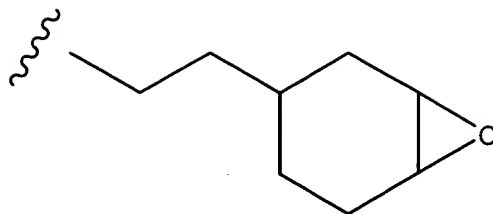
10 each Y_1 is independently a C_{1-12} alkylene group;

p is an integer from 1 to 5; m is an integer from 1 to 10; and q is an integer from 0 to 4.

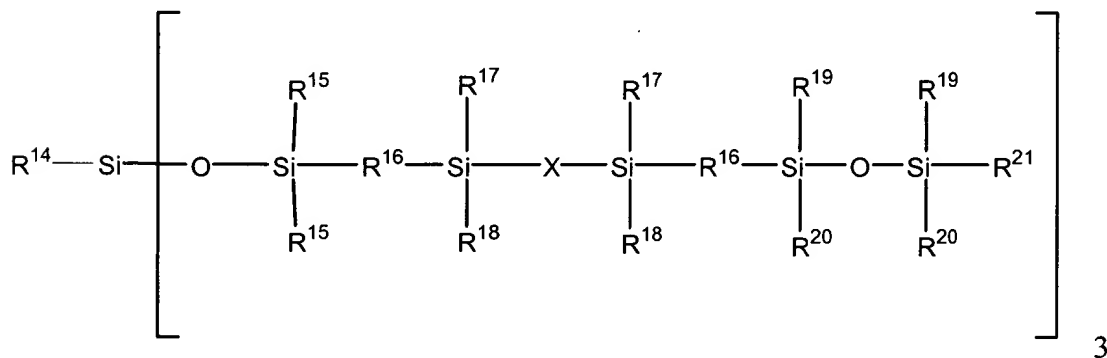
25. The holographic recording medium of Claim 24 wherein each group R^2 is independently, a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, aryl substituted C_{1-12} alkylene, or arylene group each R^6 is independently a monovalent substituted or unsubstituted C_{1-12} alkylsilane, C_{1-12} cycloalkylsilane, C_{1-12} alkoxysilane, aryl substituted C_{1-12} alkylsilane, a hydrogen, a vinyl, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} dialkylether, $(C_{1-12}$ cycloalkyl) C_{1-12} alkylether, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group.

26. The holographic recording medium of Claim 25 wherein at least one R^5 comprises a cycloalkene oxide.

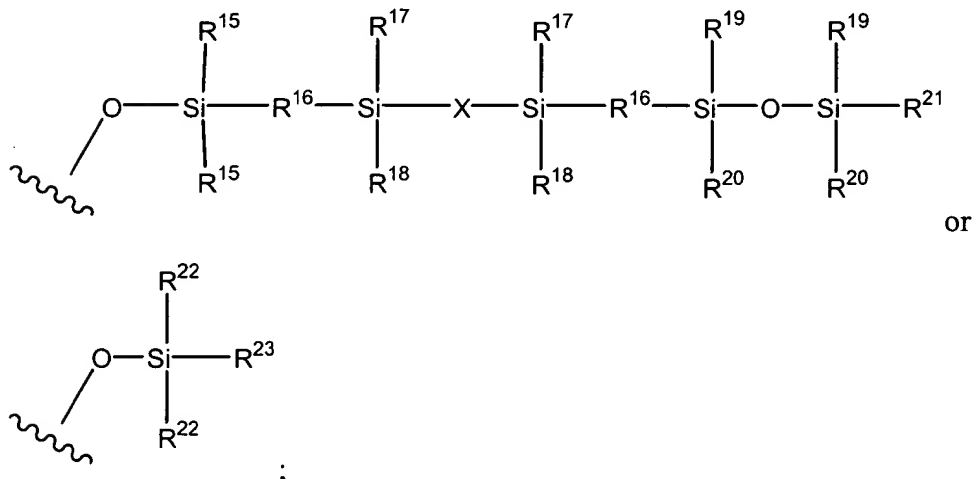
27. The holographic recording medium of Claim 26 wherein each R^5 is represented by the following structural formula:



28. The holographic recording medium of Claim 27 wherein R^1 is a methyl group; each group R^2 is an ethylene, hexylene, or octylene group; each group R^3 is a methyl group; each group R^4 is a methyl group; each group R^5 is a 2-(3,4-epoxycyclohexyl) ethyl grouping, and each group R^6 is a hydrogen or ethenyl.
29. The holographic recording medium of Claim 23 wherein the polyfunctional epoxide monomer is represented by the following structural formula:



wherein R^{14} is represented by a structural formula selected from:



each group R^{15} , each group R^{17} , each group R^{18} , each group R^{19} , each group R^{20} and each group R^{22} is independently a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group;

5 each group R^{16} is independently a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} arylalkylene, or arylene group, $-Y_1$, $-[O-Y_1]_p$, $-Y_1-Si(R^z)_2-Y_1$, $-Y_1-Si(R^z)_2-Y_1-O-Y_1-Si(R^z)_2-Y_1$, or $-Y_1-Si(R^z)_2-Y_1-Si(R^z)_2-Y_1$;

each R^{21} is independently an epoxide substituted aliphatic group having 2-10 carbon atoms;

10 R^{23} is independently hydrogen, an alkenyl, a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} -alkyl or aryl or $R^z-(O-Y_1)_m$, $(R^z)_3Si-(O-Si(R^z)_2)_q-Y_1$ or $(R^z)_3Si-(O-Si(R^z)_2)_q-O$;

each group X is independently oxygen or R^{16} ;

15 each R^z is independently a substituted or unsubstituted C_{1-12} alkyl group, C_{1-12} cycloalkylalkyl group, aryl substituted C_{1-12} alkyl group or aryl group;

each Y_1 is independently a C_{1-12} alkylene group;

p is an integer from 1 to 5; m is an integer from 1 to 10; and q is an integer from 0 to 4.

20

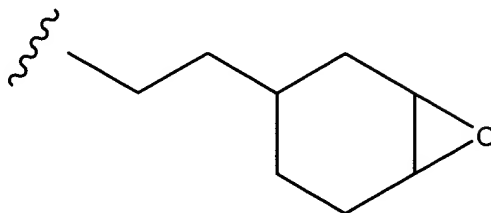
30. The holographic recording medium of Claim 29 wherein each group R^{16} is independently a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} arylalkylene or arylene group; R^{23} is, independently, a hydrogen, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} dialkylether (alkyl-O-alkylene-), C_{1-12} cycloalkyl C_{1-12} alkylether, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group; and X is oxygen.
- 25

31. The holographic recording medium of Claim 30 wherein wherein at least one

R^{21} comprises a cycloalkene oxide.

32. The holographic recording medium of Claim 31 wherein each is R^{21} represented by the following structural formula:

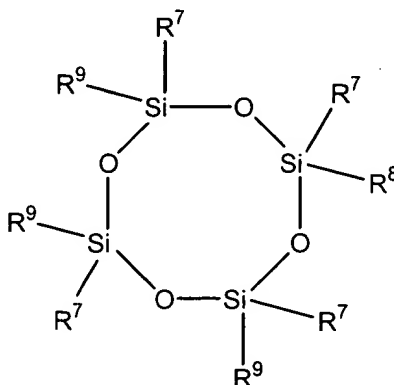
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33. The holographic recording medium of Claim 32 wherein each group R^{15} , R^{17} , R^{18} , R^{19} , R^{20} and R^{22} is a methyl group; each group R^{16} is an ethylene, hexylene, or octylene group; and R^{23} is a hydrogen, hexyl, or alkylether.

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34. The holographic recording medium of Claim 18 wherein the polyfunctional epoxide monomer is represented by the following structural formula:



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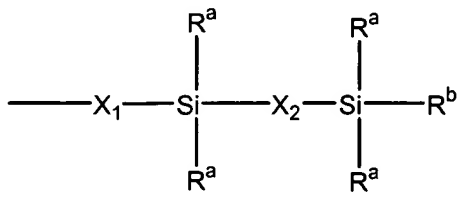
wherein:

each group R^7 is an unsubstituted aliphatic group, a substituted aliphatic group, an unsubstituted aryl group, a substituted aryl group;

each group R^8 is R^9 , hydrogen, an alkenyl, a substituted or unsubstituted C₁₋₁₂ alkyl, C₁₋₁₂ cycloalkyl, aryl substituted C₁₋₁₂-alkyl or aryl or

$R^Z-(O-Y_1)_m-$, $(R^Z)_3Si-(O-Si(R^Z)_2)_q-Y_1-$ or $(R^Z)_3Si-(O-Si(R^Z)_2)_q-O-$;

each R^9 is independently represented by the following structural formula:



5 wherein:

X_1 and X_2 are independently an inert linking group;

each R^a is independently a substituted or unsubstituted aliphatic group or a substituted or unsubstituted aryl group;

each R^b is an aliphatic group substituted with an epoxide;

10 each R^Z is independently a substituted or unsubstituted C_{1-12} alkyl group, C_{1-12} cycloalkylalkyl group, aryl substituted C_{1-12} alkyl group or aryl group;

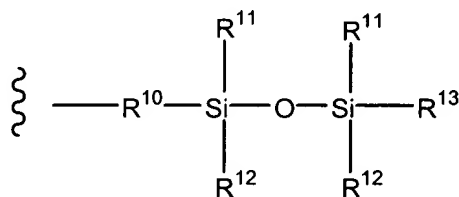
each Y_1 is independently a C_{1-12} alkylene group;

m is an integer from 1 to 10; and q is an integer from 0 to 4.

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35. The holographic recording medium of Claim 34 wherein the polyfunctional epoxide monomer is represented by the following structural formula:

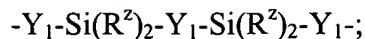
each R^7 is independently a substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aryl substituted C_{1-12} alkyl or aryl group;



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each R^9 is represented by

each group R^{10} is independently a substituted or unsubstituted C_{1-12} alkylene, C_{1-12} cycloalkylene, C_{1-12} arylalkylene, or arylene group,
 $-Y_1-[O-Y_1]_p-$, $-Y_1-Si(R^Z)_2-Y_1-$, $-Y_1-Si(R^Z)_2-Y_1-O-Y_1-Si(R^Z)_2-Y_1-$, or



each R^Z is independently a C₁₋₁₂ alkyl group;

each Y_1 is independently a C₁₋₁₂ alkylene group;

p is an integer from 1 to 5;

- 5 each group R^{11} and R^{12} is independently a substituted or unsubstituted C₁₋₁₂ alkyl, C₁₋₁₂ cycloalkyl, aryl substituted C₁₋₁₂ alkyl group or aryl group; and

each group R^{13} is independently an epoxide substituted aliphatic group having from 2-10 carbon atoms.

10

36. The holographic recording medium of Claim 35 wherein:

R^8 is substituted or unsubstituted C₁₋₁₂ alkylsilane, C₁₋₁₂ cycloalkylsilane, C₁₋₁₂ alkoxy silane, arylsubstituted C₁₋₁₂ alkyl silane or a substituted or unsubstituted 1-alkenyl group or a substituted or unsubstituted C₁₋₁₂ *n*-alkenyl group where *n* is greater than or equal to 1;

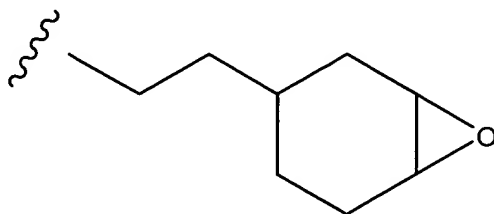
15

R^{10} is independently a C₁₋₁₂ alkylene, C₁₋₁₂ cycloalkylene, C₁₋₁₂ arylalkylene, or arylene group.

37. The holographic recording medium of Claim 36 wherein at least one group R^{13} comprises a cycloalkene oxide.

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38. The holographic recording medium of Claim 37 wherein each R^{13} is represented by the following structural formula:



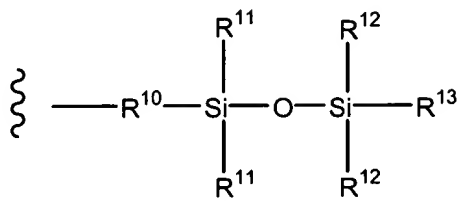
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39. The holographic recording medium of Claim 38 wherein:

R^7 is a methyl group,

R^8 is -ethenyl or R^9 ;



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each R^9 is

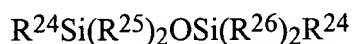
;

each group R^{10} is $-(CH_2)_2-$, $-(CH_2)_6-$ or $-(CH_2)_8-$;

each group R^{11} and R^{12} are a methyl group; and

each group R^{13} is a 2-(3,4-epoxycyclohexyl) ethyl group.

- 10 40. The holographic recording medium of Claim 19 wherein the difunctional epoxide monomer is represented by the following structural formula:



where each group R^{24} is a 2-(3,4-epoxycyclohexyl)ethyl grouping; each grouping R^{25} is a methyl group, and each group R^{26} is a methyl group.

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41. The holographic recording medium of Claim 18 wherein the holographic medium comprises between about 0.25 to about 5 parts by weight of the difunctional epoxide monomer per part by weight of the polyfunctional epoxide monomer.

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42. The holographic recording medium of Claim 18 wherein the holographic medium comprises from about 90 parts binder and 10 parts monomer or oligomer (w/w) to about 10 parts binder and 90 parts monomer or oligomer (w/w).

- [illegible]